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# *Quick Response* REPORT

RESULTS OF WEIGHTED DROGUE TRAY MODIFIED LUU-2B/B  
FLARE SEPARATION TESTS FROM SUU-25F/A/FA-18 AIRCRAFT

by

Mr. Bruce Julian

7 November 1986

SECOND INTERIM REPORT

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Prepared for:

NAVAL AIR SYSTEMS COMMAND  
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**NAVAL AIR TEST CENTER  
PATUXENT RIVER, MARYLAND**

DEPARTMENT OF THE NAVY  
NAVAL AIR TEST CENTER  
PATUXENT RIVER, MARYLAND 20670-5304

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From: Commander, Naval Air Test Center, Patuxent River, Maryland 20670-5304  
To: Commander, Naval Air Systems Command (AIR-540), Naval Air Systems Command Headquarters, Washington, D.C. 20361

Subj: NAVAIRTESTCEN QUICK RESPONSE REPORT SA-125R-86, RESULTS OF WEIGHTED DROGUE TRAY MODIFIED LUU-2B/B FLARE SEPARATION TESTS FROM SUU-25F/A/FA-18 AIRCRAFT, SECOND INTERIM REPORT, AIRTASK A540-5406/159-5/5201000002, WORK UNIT A54062D/01

Ref: (a) Meeting between Mr. B. Julian (NAVAIRTESTCEN)/Mr. K. Sanders (NAVAIRSYSCOM) of 5 Sep 1986

1. As a result of the meeting conducted at NAVAIRSYSCOM on 5 September 1986, flight testing was initiated using modified LUU-2B/B flares with weighted drogue trays loaded in SUU-25F/A's carried on board F/A-18 aircraft. Flight testing began on 24 September 1986 with two SUU-25F/A dispensers loaded on a vertical ejector rack (VER) on station 8 of an F/A-18 aircraft. Only the outboard dispenser was loaded and the inboard was carried in order to create the desired airflow pattern. The loaded dispenser contained six flares: two flares in tubes 1 and 2 and one forward flare in tubes 3 and 4. In tubes 1 and 2, only the aft flares were armed with ejection cartridges. The dispenser was loaded in this configuration in order to evaluate the separation characteristics of both forward and aft flares without having to fire a forward flare with the plastic spacer tee. The spacer tee posed a major concern for fear that it might separate from the end cap of the forward flare and impact the stabilator.

2. The flight was conducted at 400 KCAS, 5,000 ft, straight and level 1.0 g. All four flares separated satisfactorily even though two flares had their end caps come off before clearing the stabilator. One of these end caps approached to within approximately 8 in. of the stabilator. The flares all appeared to be at least 2 ft beneath and 6 in. to 1 ft outboard of the stabilator. The third flare showed a slight pitching up motion before clearing the stabilator, but its translation was no more than 5 to 10 deg.

3. After reviewing the on board and ground station films, it was decided to fly a second flight at 450 KCAS in the same configuration and similar flight conditions. This flight was given the additional coverage by a photochase aircraft and the on board real-time video performance was improved.

4. The 450 KCAS flight was conducted on 25 September 1986. On the first live run, real-time video coverage showed the flare beginning to pitch up shortly after release. The flare translated approximately 60 to 70 deg as it passed the stabilator. This unsatisfactory separation, in close proximity to the stabilator, led to the immediate termination of the test. The aircraft was instructed to return to base for inspection. Postflight inspection revealed that no store-to-aircraft collision had occurred.

5. Although the on board film revealed that the flare was outboard of the stabilator as it rotated, the separation trend was nonetheless unacceptable and this series of tests was terminated. The ejection velocity of the flare was determined from film analysis to be approximately 30 ft/sec. This ejection velocity is well within the range of that experienced by aft flares in other LUU-2B/B tests.

6. In response to the failure of the weighted drogue tray system, an effort was made to conduct a ground test using a SUU-25F/A mounted on centerline station 5 of an F/A-18A aircraft. Previous fit tests had shown the store to be compatible on this station. However, in our effort, the full scale development aircraft's fuel connection in the centerline parent station interfered with the electrical connector on the dispenser. In addition, the swaybraces on the rack would not make contact with the dispenser even when adjusted full down. Furthermore, with the pod suspended in the rack, the clearance of a perfectly stable level flare would only clear the belly of the aircraft by approximately 2 to 4 in. This places considerable doubt on the ability of a centerline pod mounting to provide flare capability.

7. Analysis of the unexpected behavior in a modified flare that had previously performed satisfactorily up to 550 KCAS on F-4J aircraft has led to the following hypothesis: unlike the F-4J and the A-4M testbeds previously used in the tests of the modified LUU-2B/B in conjunction with the SUU-25F/A, the F/A-18 aircraft's parent stations have a 3 deg nosedown attitude. Review of on board film indicates that this nosedown attitude may reach 5 to 7 deg during flight when the SUU-25F/A's are mounted on VER's. The flight path of the ejected flares is upward at this offset angle which immediately reduces the potential clearance between the flare and the stabilator. In addition, as the flight path of the flare is angled upward, the aft end of the flare enters the relative wind air flow before the forward end clears the turbulent stagnation area immediately aft of the dispenser. The application of this high pressure air flow to the aft end and a low pressure flow to the forward end causes a moment force which initiates the rotation of the flare. This effect is amplified as the flare travels further upward in its angled trajectory.

8. NAVAIRTESTCEN proposes a two fold plan of attack to develop an F/A-18/SUU-25F/A flare capability. First, a hardback adapter needs to be developed that would attach to the SUU-25F/A and give the dispenser a lower displacement and remove the current dispenser nosedown attitude. This adapter would be jettisonable with the dispenser and, thus, have no requirement for electrical interface with aircraft software. Second, the Naval Weapons Support Center, Crane, Indiana, needs to develop another concept to stabilize the flare other than the weighted drogue tray. The engineering requirements to develop a drogue tray system that exhibits repeatable tray separation are immense; however, the danger to aircraft and aircrews should this system fail has already been demonstrated by the history of drogue tray incidents.

9. Any questions or information in this matter should be directed to our point of contact, Mr. C. B. Julian (SA81F), AUTOVON 356-4171, or commercial (301) 863-4171.

  
J. Q. HOEG  
By direction

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15 May 03

MEMORANDUM FOR Administrator, Defense Technical Information  
Center (DTIC-OCA), 8725 John J. Kingman Road, Fort Belvoir,  
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2. Point of contact for this request is Ms. Kristin Morrow at DSN 343-7327 or by e-mail at Kristin.Morrow@det.amedd.army.mil.

FOR THE COMMANDER:

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